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DS2121A Ultra3 LVD/SE SCSI Terminator

FEATURES

- Fully compliant with Ultra2, Ultra3, and Ultra 160 *LVD-only* SCSI
- Provides Low Voltage Differential (LVD) termination for 9 signal line pairs
- 5% tolerance on SE and LVD termination resistance
- Low power-down capacitance of 3 pF
- Onboard thermal shutdown circuitry
- SCSI bus hot plug compatible

PIN ASSIGNMENT

VREF	1	28	TPWR
RIP	2	27	TPWR
RIN	3	26	R9N
R2P	4	25	R9P
R2N	5	24	R8N
HS GND	6	23	R8P
R3P	7	22	HS GND
R3N	8	21	R7N
R4P	9	20	R7P
R4N	10	19	R6N
R5P	11	18	R6P
R5N	12	17	DIFF_CAP
ISO	13	16	DIFFSENSE
GND	14	15	MSTR/SLV

DS2121AE 28-Pin TSSOP

DESCRIPTION

The DS2121A LVD SCSI Terminator is a Low Voltage Differential (LVD) terminator. If the device is connected in an LVD-only bus, the DS2121A will use LVD termination. If any SE devices are connected to the bus, the DS2121A will disconnect from the bus. This is accomplished automatically inside the part by sensing the voltage on the SCSI bus DIFFSENS line.

For the LVD termination, the DS2121A integrates two current sources with nine precision resistor strings. Three DS2121A terminators are needed for a wide SCSI bus.

REFERENCE DOCUMENTS

- SCSI Parallel Interface 2 (SPI-2) {X310/1142D}
- SCSI-3 Parallel Interface (SPI) {X3T10/855D}
- SCSI-3 Fast-20 {X3T10/1071D}
- SCSI-2 {X3.131-1994}

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FUNCTIONAL DESCRIPTION

The DS2119 combines LVD and SE termination with DIFFSENS sourcing and detection.

A bandgap reference is fed into two amplifiers, which creates a 1.25V. If the SCSI bus is in LVD mode, then the 1.25V reference will be used. The DIFFSENSE circuitry decodes trinary logic. There will be one of three voltages on the SCSI control line called DIFFSENS. Two comparators and a NAND gate determine if the voltage is below 0.6V, above 2.15V, or in between. That indicates the mode of the bus to be SE, HVD, or LVD, respectively.

The DS2121A's DIFF_CAP pin monitors the DIFFSENS line to determine the proper operating mode of the device. The DIFFSENSE pin can also drive the SCSI DIFFSENS line (when MSTR/SLV = 1) to determine the SCSI bus operating mode. The DS2121A switches to the termination mode that is appropriate for the bus based on the value of the DIFFSENS voltage. These modes are:

LVD mode LVD termination is provided by a precision laser trimmed resistor string with two current sources. This configuration yields a 105Ω differential and 150Ω common mode impedance. A fail-safe bias of 112 mV is maintained when no drivers are connected to the SCSI bus.

SE mode The DS2121A identifies that there is a SE (single-ended) device on the SCSI bus and isolates the termination pins from the bus.

HVD Isolation Mode The DS2121A identifies that there is an HVD (high voltage differential) device on the SCSI bus and isolates the termination pins from the bus.

When ISO = 1, the termination pins are isolated from the SCSI bus, Vref remains active. During thermal shutdown, the termination pins are isolated from the SCSI bus and Vref becomes high impedance. The DIFFSENSE driver is shut down during either of these two events.

To ensure proper operation, the TPWR pin should be connected to the SCSI bus TERMPWR line. As with all analog circuitry, the TERMPWR and VDD lines should be bypassed locally. A $2.2\ \mu F$ capacitor and a $0.01\ \mu F$ high frequency capacitor are recommended between TPWR and ground and placed as close as possible to the DS2121A. The DS2121A should be placed as close as possible to the SCSI connector to minimize signal and power trace length, thereby resulting in less input capacitance and reflections which can degrade the bus signals.

To maintain the specified regulation, a $4.7\ \mu F$ capacitor is required between the Vref pin (VREF) and ground of each DS2121A. A high frequency cap ($0.1\ \mu F$ ceramic recommended) can also be placed on the Vref pin in applications that use fast rise/fall time drivers. A typical SCSI bus configuration is shown in Figure 2.

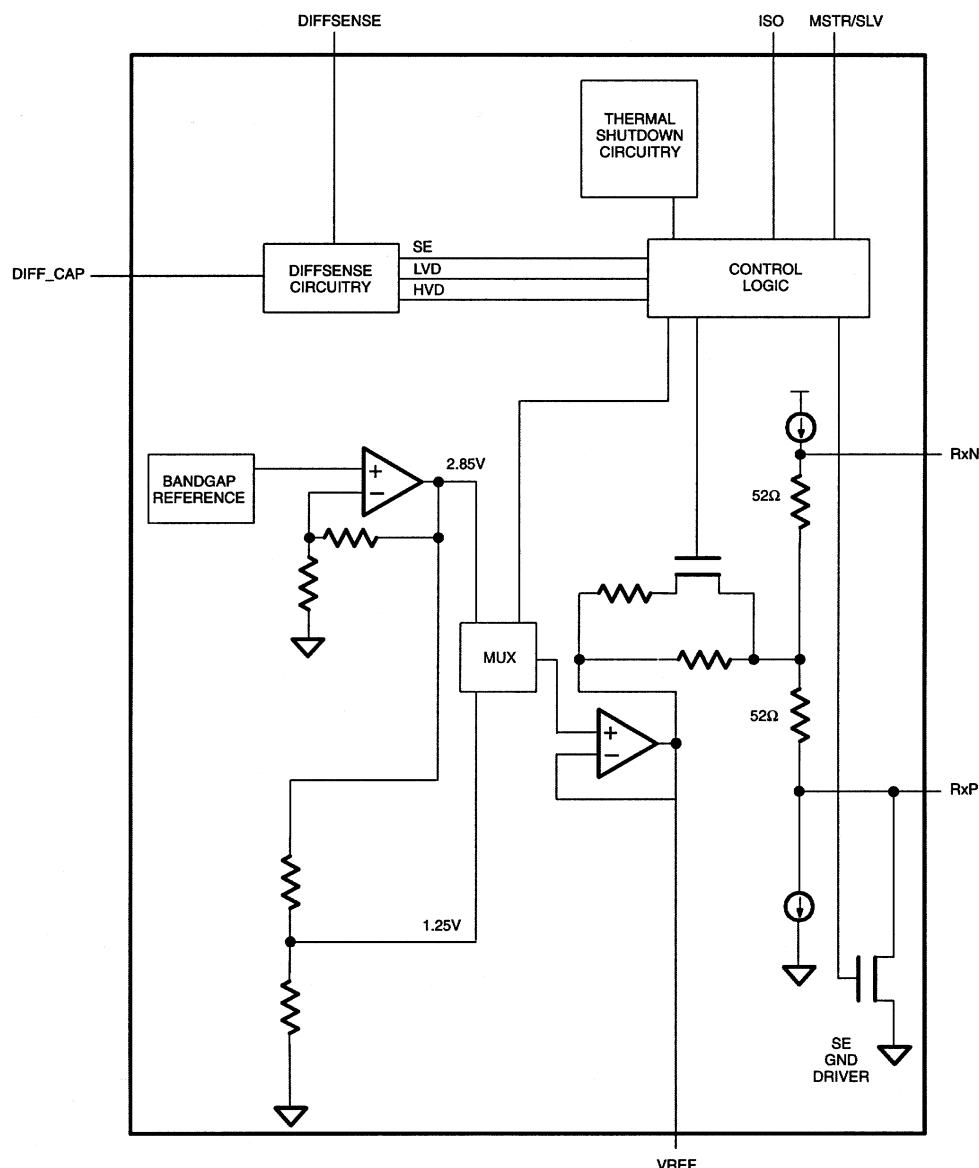
DIFFSENS noise filtering The DS2121A incorporates a digital filter to remove high frequency transients on the DIFFSENS control line, thereby eliminating erroneous switching between modes. This filter eliminates the need for the external capacitor and resistor, which heretofore performed this function.

NOTE:

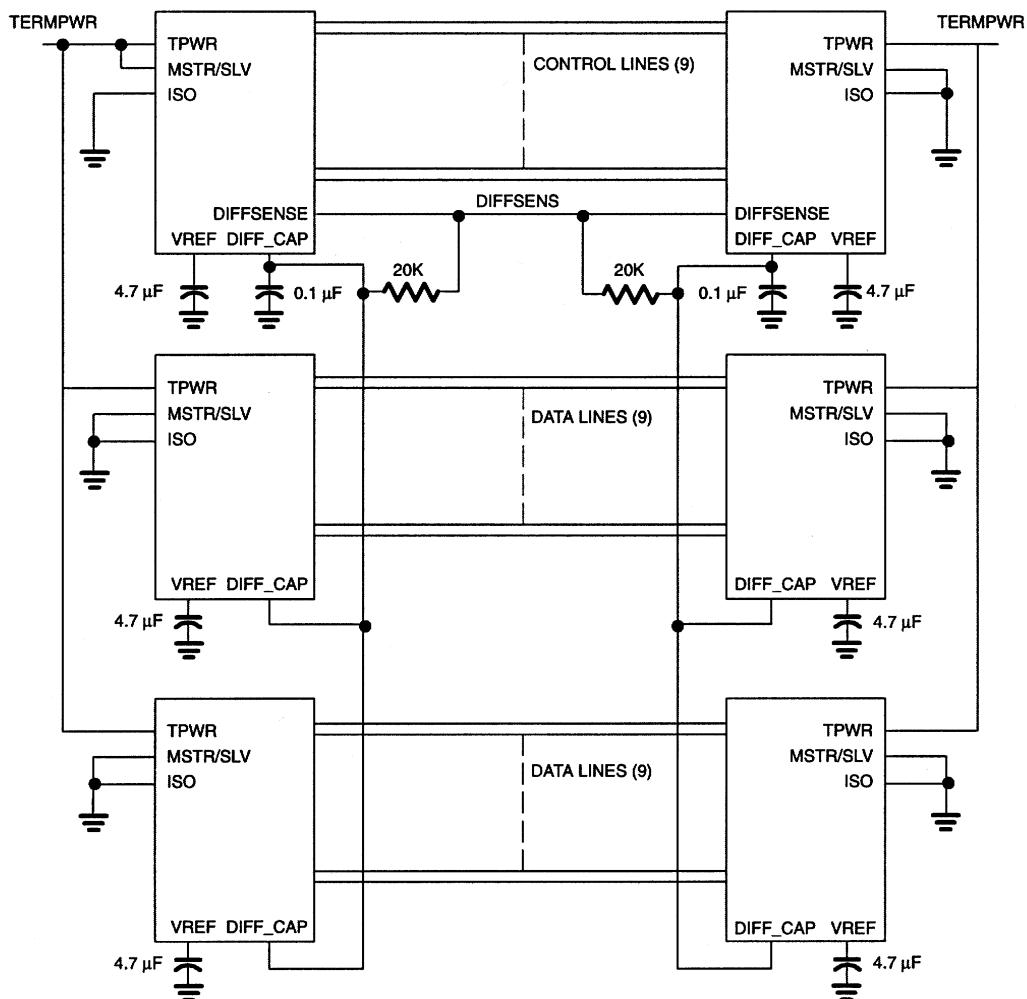
DIFFSENS - Refers to the SCSI bus signal.

DIFFSENSE - Refers to the Dallas Semiconductor pin name and internal circuitry relating the DIFFSENS driver.

DS2121A BLOCK DIAGRAM Figure 1



SCSI BUS CONFIGURATION Figure 2



PIN DESCRIPTION Table 1

PIN	SYMBOL	DESCRIPTION
1	VREF	Reference Voltage. 1.25-volt reference in LVD mode; must be decoupled with a 4.7 μ F cap.
2-5, 7-12, 18-21, 23-26	RxP, RxN	Signal Termination. Connect to SCSI bus signal lines.
6, 22	HS GND	Heat Sink Ground. Internally connected to the mounting pad. Should be grounded.
13	ISO	Isolation. When pulled high, the DS2121A isolates its bus pins (RxP, RxN) from the SCSI bus.
14	GND	Ground. Signal ground; 0.0 volts.
15	MSTR/SLV	Master/slave. Mode select for the non-controlling terminator. When pulled high, MSTR enables the DIFFSENSE driver.
16	DIFFSENSE	DIFFSENSE. Output to drive the SCSI bus DIFFSENS line.
17	DIFF_CAP	DIFFSENSE CAPACITOR. Connect a 0.1 μ F capacitor for DIFFSENSE filter. Input to detect the type of device (differential or single-ended) on the SCSI bus.
27, 28	TPWR	Termination Power. Connect to the SCSI TERMPWR line and decouple with a 2.2 μ F capacitor.

RECOMMENDED OPERATING CONDITIONS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Termpower Voltage LVD mode	$V_{tpwr}(LVD)$	2.7		5.5	V	
Logic 0	V_{il}	-0.3		+0.8	V	
Logic 1	V_{ih}	2.0		$V_{tpwr} + 0.3$	V	
Operating Temperature	V_{amb}	0		70	$^{\circ}$ C	

LOW VOLTAGE DIFFERENTIAL CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Differential Mode Termination Resistance	R_{dm}	100		110	Ohms	
Common Mode Termination Resistance	R_{cm}	110		190	Ohms	
Differential Mode Bias	V_{dm}	100		125	mV	4
Common Mode Bias	V_{cm}	1.125		1.375	V	

DC CHARACTERISTICS

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Termpower Current	I_{tpmr}		12		mA	4
Input Leakage High	I_{ih}	-1.0			μ A	
Input Leakage Low	I_{il}			1.0	μ A	
Output Current High	I_{oh}	-1.0			mA	5, 7
Output Current Low	I_{ol}	4.0			mA	6, 7
DIFFSENS SE Operating Range	V_{seor}	-0.3		0.5	V	
DIFFSENS LVD Operating Range	V_{lvdor}	0.7		1.9	V	
DIFFSENS HVD Operating Range	$V_{hv dor}$	2.4		$V_{tpwr} + 0.3$	V	

PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
DIFFSENSE Driver Output Voltage	V_{dso}	1.2		1.4	V	8, 9
DIFFSENSE Driver Source Current	I_{dsh}	5		15	mA	8, 10, 12
DIFFSENSE Driver Sink Current	I_{dsi}	20		200	μA	8, 11
Thermal Shutdown			150		$^{\circ}C$	3

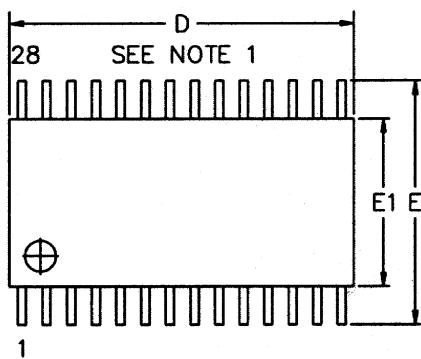
REGULATOR CHARACTERISTICS

(0°C to 70°C)

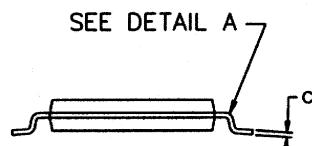
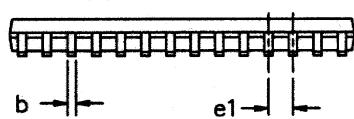
PARAMETER	SYMBOL	MIN	TYP	MAX	UNITS	NOTES
Line Regulation	L_{IREG}		1.0	2.5	%	
Load Regulation	L_{OREG}		1.3	3.5	%	
Current Limit	I_{LIM}		550		mA	
Sink Current	I_{SINK}	200			mA	

NOTES:

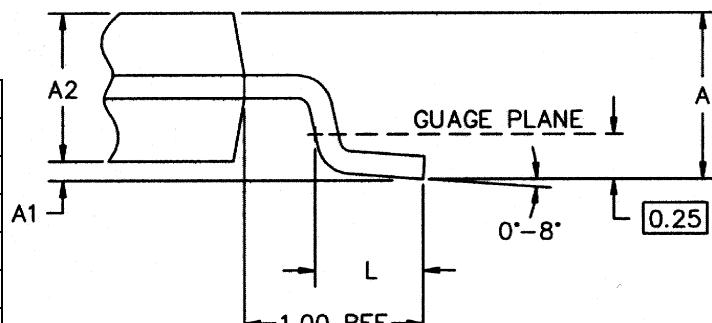
1. Vline = 0-3.0 volts.
2. Vline = 0.2 volts.
3. Guaranteed by design.
4. All lines open.
5. $V_{OUT} = 2.4$ volts.
6. $V_{OUT} = 0.4$ volts.
7. SE/LVD/HVD pins only.
8. MSTR/SLV = 1.
9. $I_{ds} = 0-5$ mA.
10. $V_{dso} = 0.0$ volts.
11. $V_{dso} = 2.75$ volts.
12. TPWR = 5.5V

DS2121A 28-PIN SSOP PACKAGE**NOTES:**

1. DIMENSION "D" DOES NOT INCLUDE MOLD MISSMATCH, FLASH OR PROTRUSIONS. MOLD MISSMATCH, FLASH AND PROTRUSIONS SHALL NOT EXCEED 0.15 PER SIDE.
2. DIMENSION "B" DOES NOT INCLUDE DAMBAR PROTRUSION. DAMBAR PROTRUSION SHALL NOT BE LOCATED ON THE LOWER RADIUS OF THE FOOT.



DIM	MIN	MAX
A	-	1.10
A1	0.05	-
A2	0.75	1.05
c	0.09	0.20
L	0.50	0.75
e1	0.65 BSC	
b	0.18	0.30
D	9.60	9.80
E1	4.40 BSC	
E	6.20	6.60



DETAIL A